ATM

INDRA ADS-B SYSTEM

AUTOMATIC DEPENDANT SURVEILLANCE – BROADCAST

JULY -2014

indra

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DEFINITION

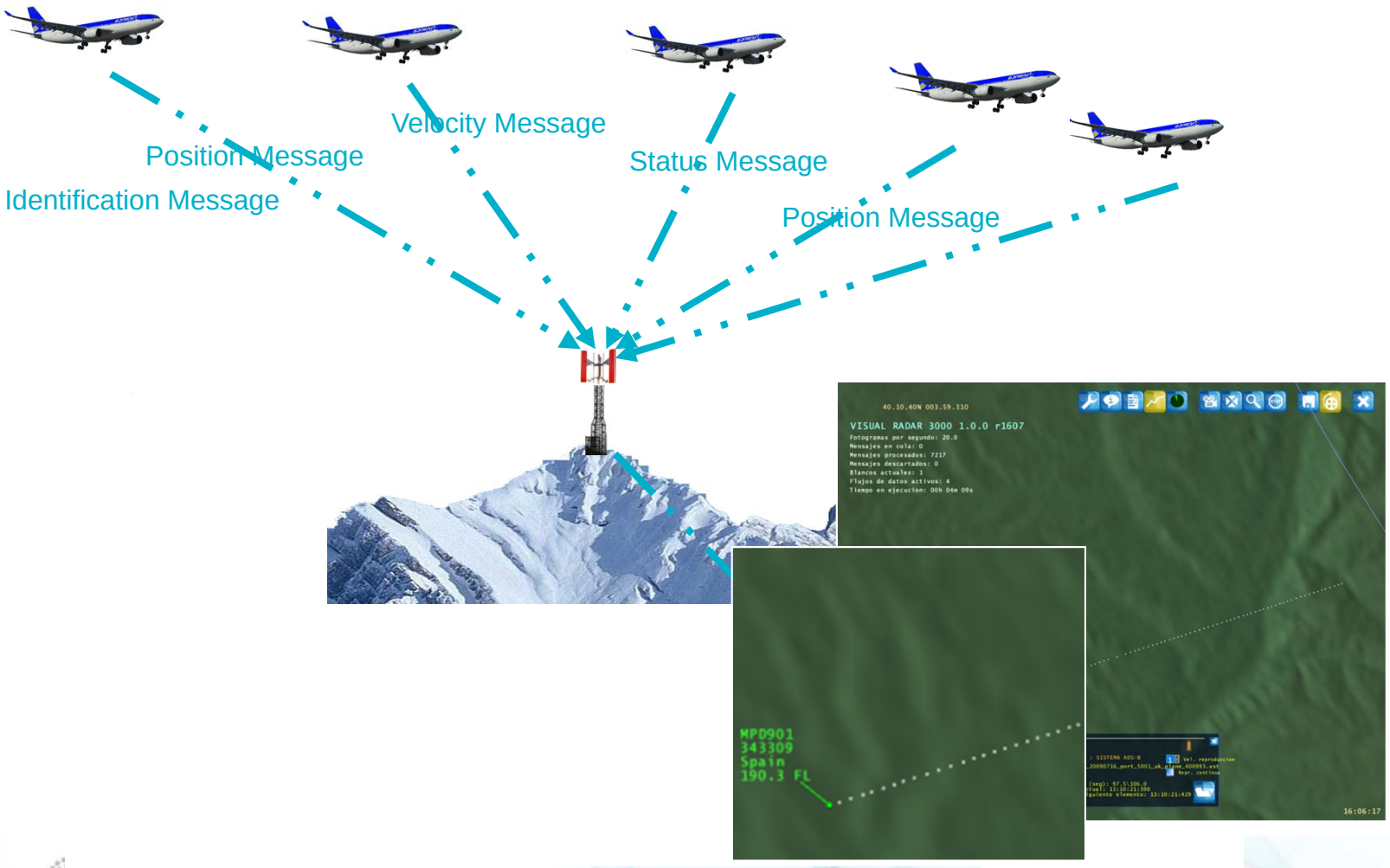
- **A**utomatic: Aircraft equipped with ADS-B transmit automatically information about Identification, Position, Velocity Vector, Flight Status....

- **D**ependant: Information depends on aircraft equipment capabilities.

- **S**urveillance: ADS-B provides surveillance over ADS-B equipped aircraft.

- **B**roadcast: Information is broadcast from the aircraft using 1090 MHz Extended Squitter messages in Mode S Down Format DF17.

INFORMATION USED



ATM APPLICATIONS

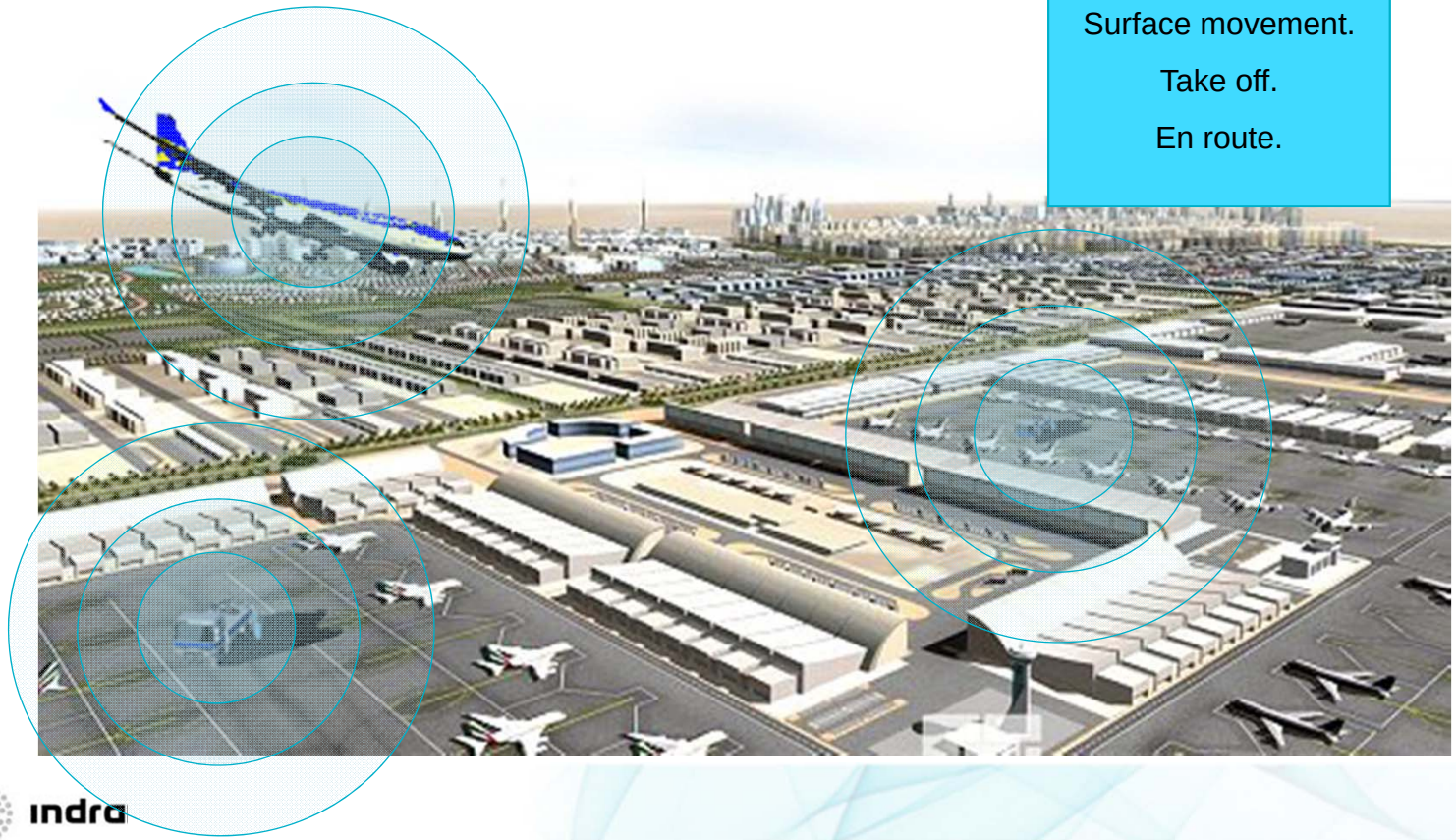
Approach.

Landing.

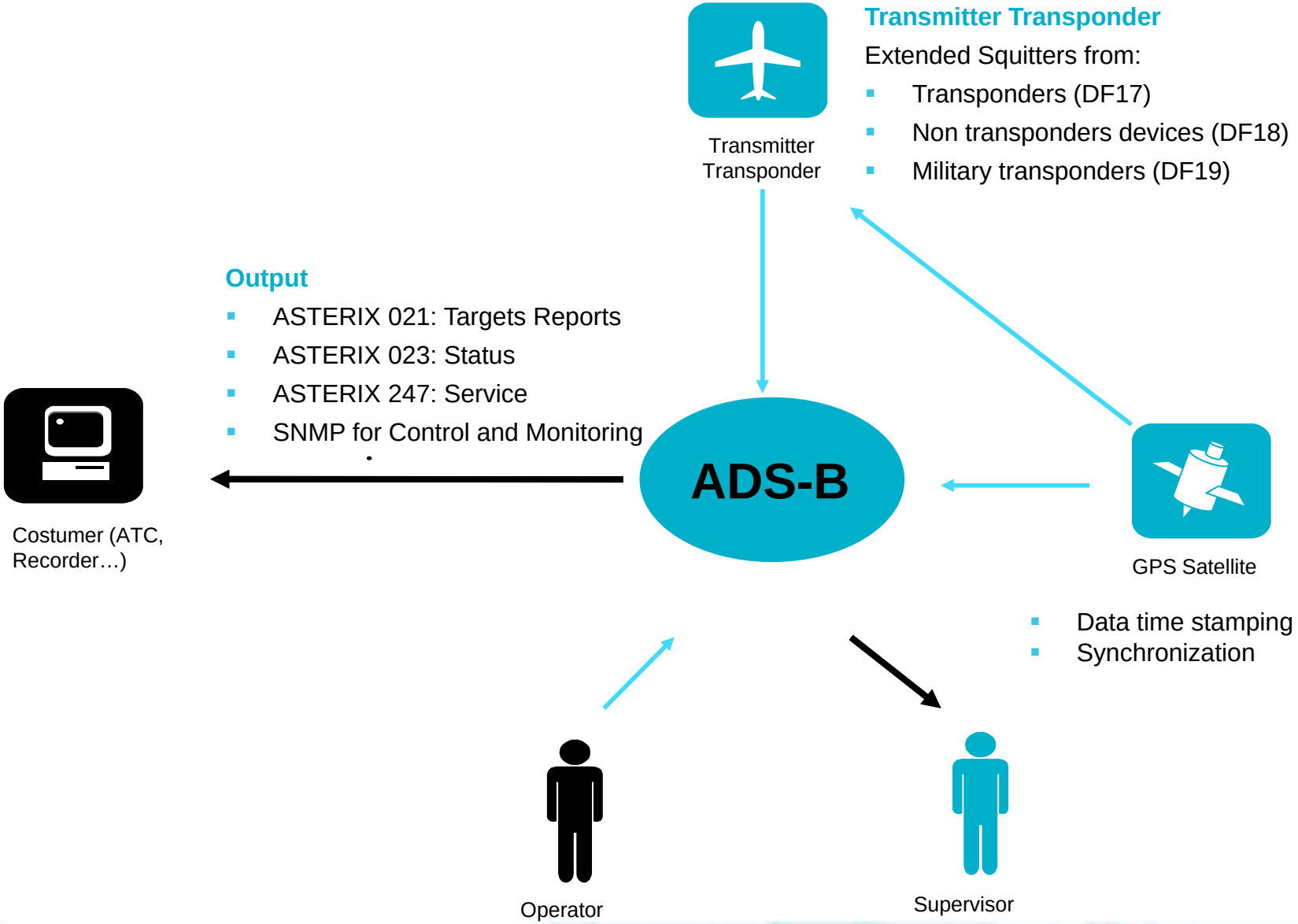
Surface movement.

Take off.

En route.



SYSTEM CONTEXT



MAIN BENEFITS

1. High data update rate: Once per 0,5 seconds in ADSB-GSS equipment (Configurable).

2. Accuracy:

Position reported by ADS-B is more accurate than current radar positions.

3. Lower Costs:

ADS-B reduces the costs of deployment & installation.

Operation & Maintenance costs also reduced (No rotating elements).

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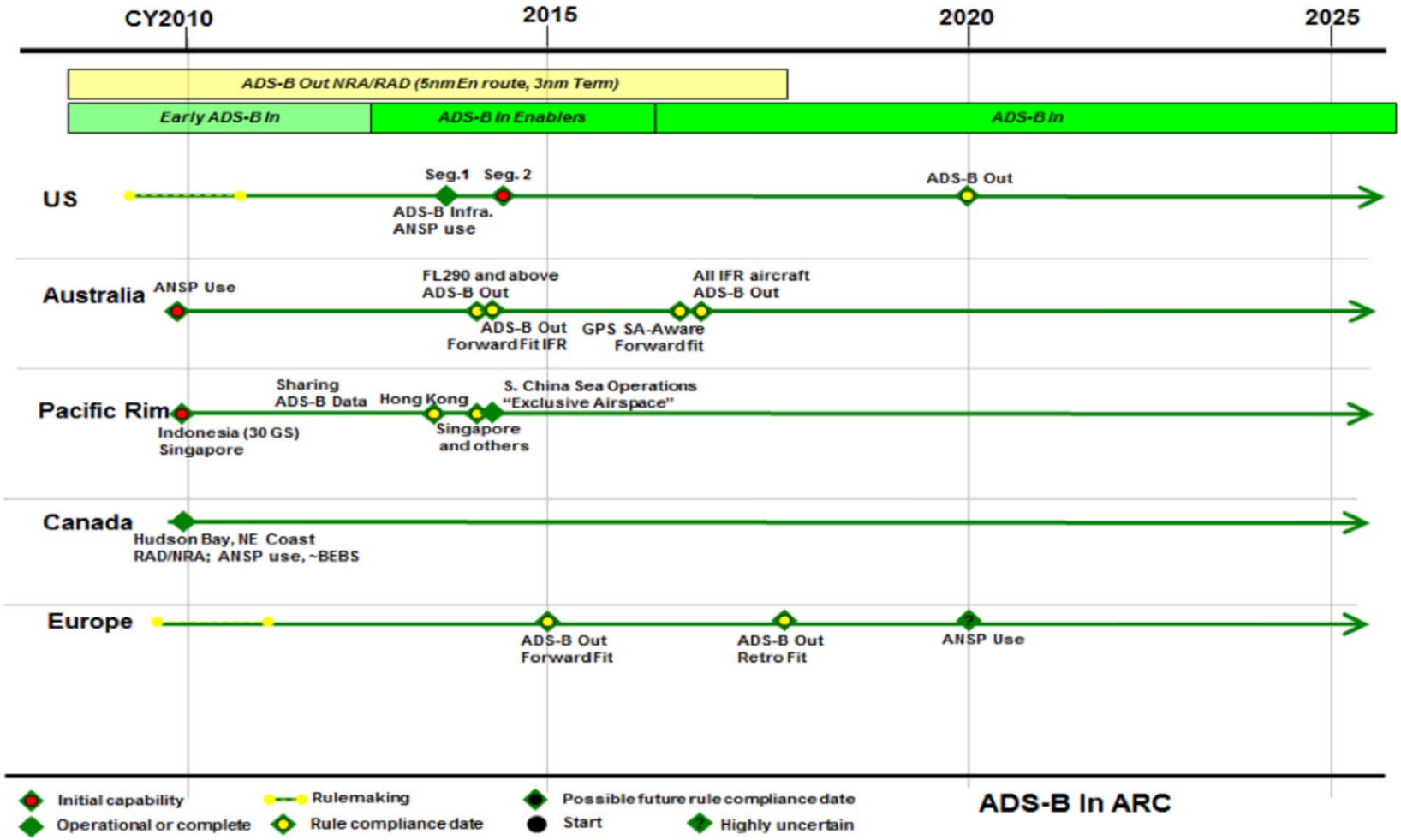
ADS-B WORLD-WIDE REGULATIONS



U.S.A: "By January 1, 2020 all aircraft operating on U.S. transponder airspace will be required to carry equipment that produces an ADS-B Broadcast."

Australia: "On and after 12 December 2013, any aircraft that is operated at or above FL 290 must carry ADS-B transmitting equipment…"

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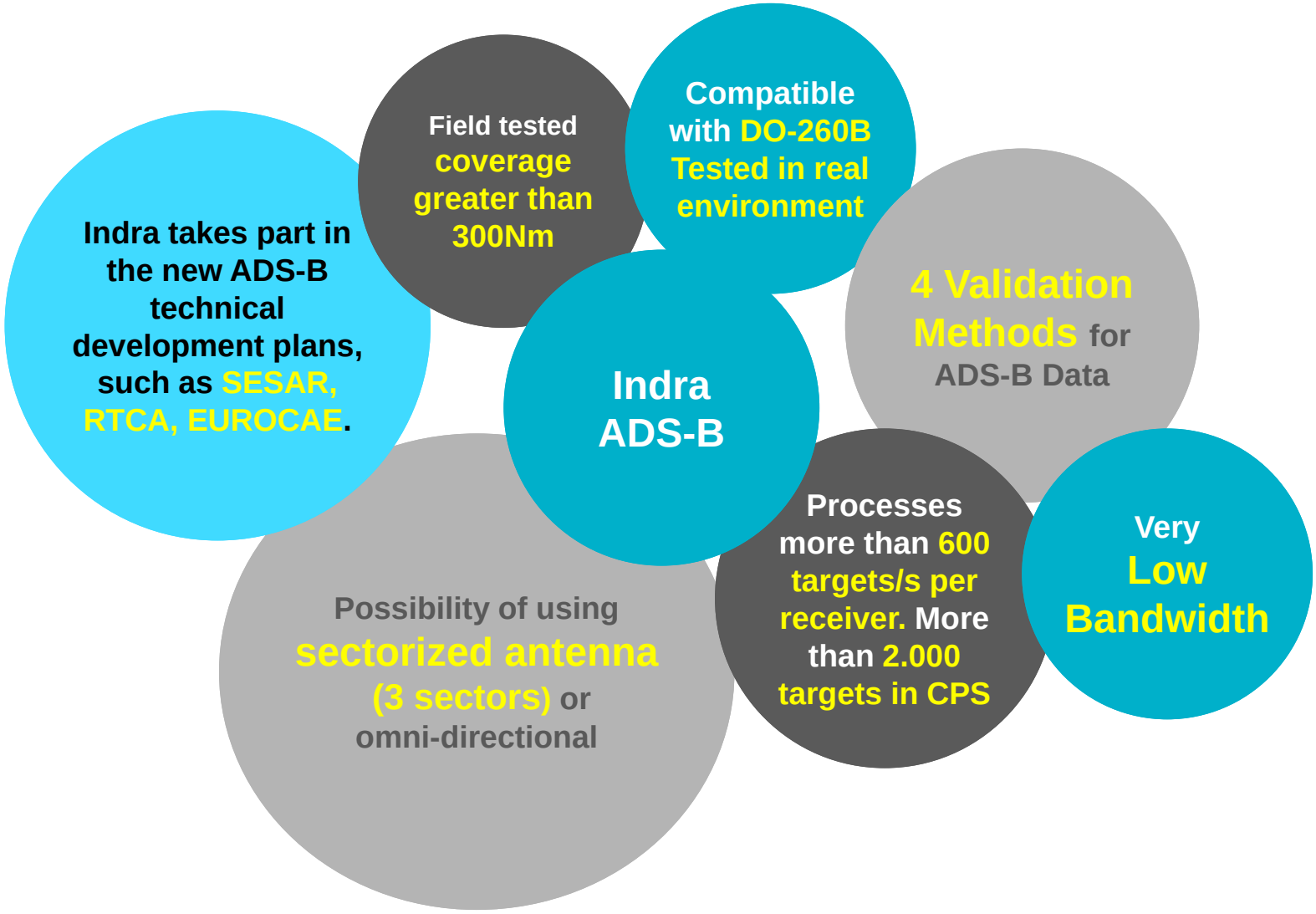
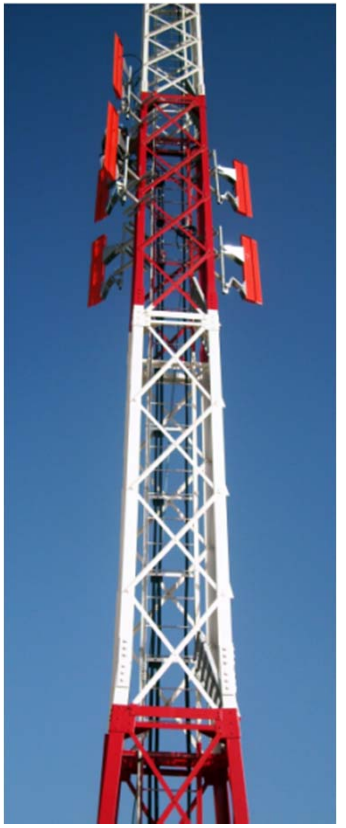
HIGHLIGHTS

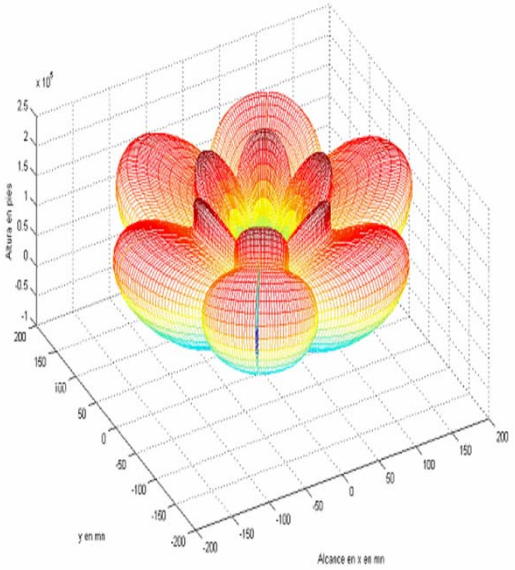

Indra takes part in the new ADS-B technical development plans, such as SESAR, RTCA, EUROCAE.
Field tested coverage greater than 300Nm
Compatible with DO-260B Tested in real environment
Indra ADS-B
4 Validation Methods for ADS-B Data
Possibility of using sectorized antenna (3 sectors) or omni-directional
Processes more than 600 targets/s per receiver. More than 2.000 targets in CPS
Very Low Bandwidth

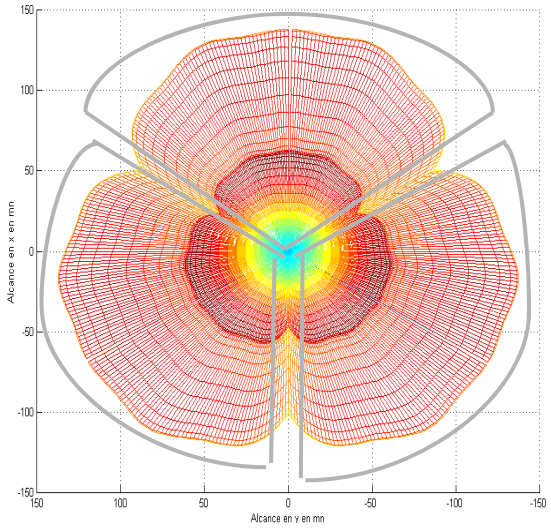
VALIDATION OF ADS-B DATA

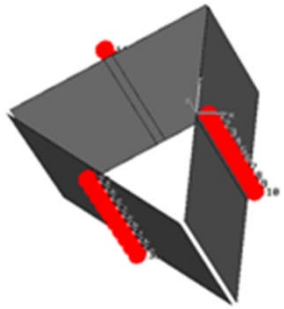
Indra ADS-B System provides 4 validation methods:



1. Angle of arrival validation: The **sectorized antenna** of Indra's ADS-B System allows the determination of the direction or sector of arrival of the received messages, **this direction is correlated with the angle of arrival obtained from the position reported by the aircraft.**

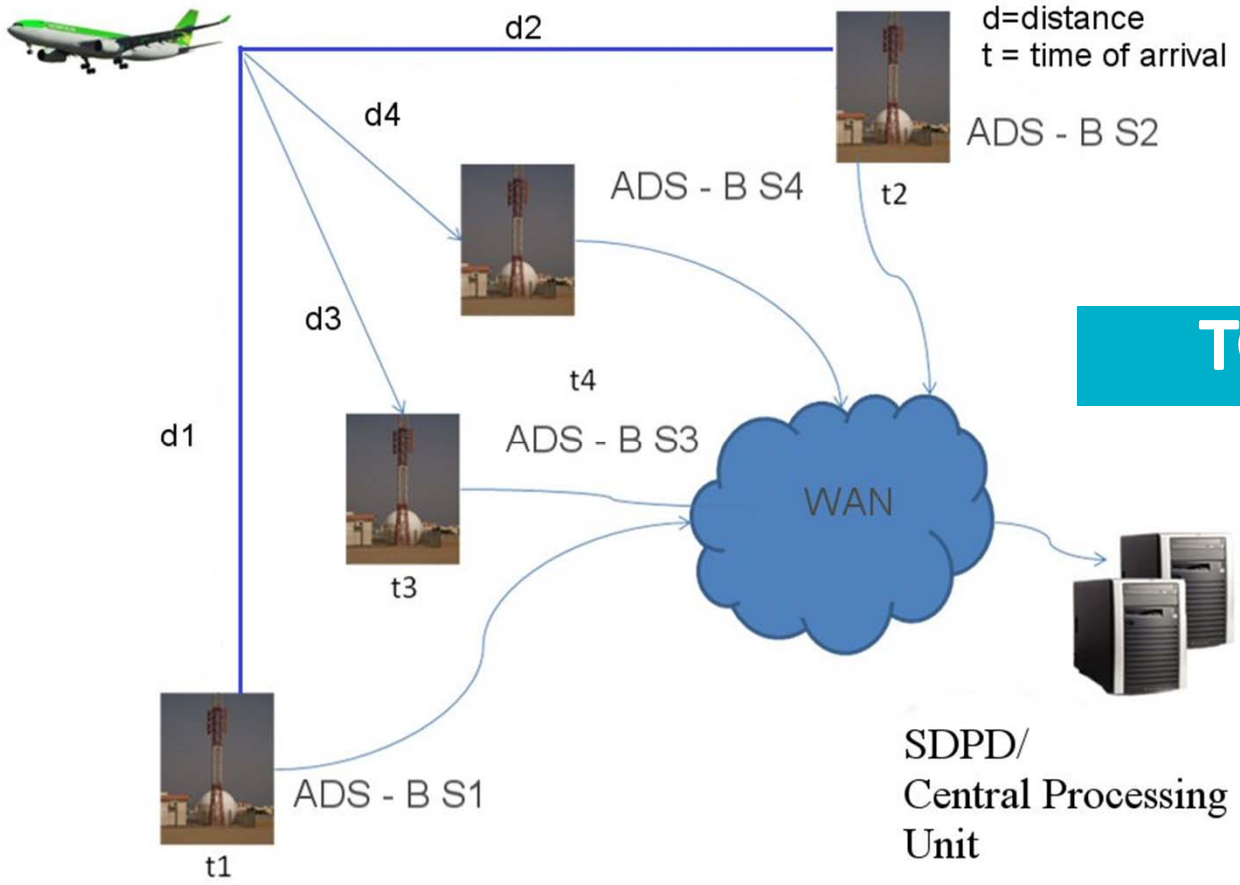






VALIDATION OF ADS-B DATA

2. Time of arrival (TOA) validation: The principle of this validation method lies in the correlation between of Time of Arrival of Extended Squitters and the reported distance from multiple receivers.

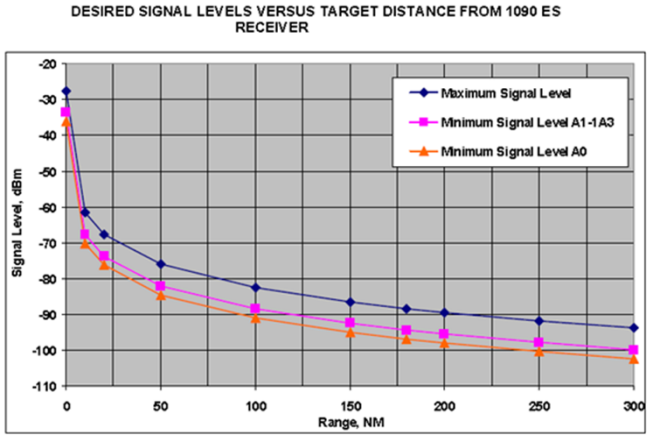


TOA Validation

VALIDATION OF ADS-B DATA

3. Power measure versus range:

Depending on the type of transponder of the target and other parameters such as the antenna gain, height, distance, **Indra ADS-B system will expect to receive ES messages from a target that will be inside a range of power values.**



4. Target velocity against the ADS-B received target position change:

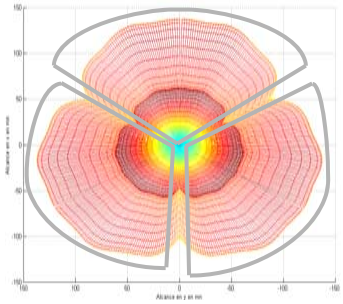
Actual and historic position and velocity information of the same target are also used to cross-check the credibility of both data items.

These validation methods have been developed and tested in SESAR program.

MULTICHANNEL RECEIVER

1. Indra Multichannel Receiver offers the capability of using a 3 sectors antenna:
Sectorized antennas are **easy to install since they do not need to be sited at the top of towers** and **admit other elements located in parallel**. On the other hand, omnidirectional antennas shall be installed with no other obstacles in parallel, which could be impossible on many occasions (i.e: Installation of ADS-B in a tower where existing radar is already installed at the top). **Reduces multipath and reflections.**

2. Reduces the noise and increase the range: Field-tested **range beyond 300NM**.



3. Possibility of using omni-directional antenna.

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ADS-B RECEIVER

Upgrades & Improvements:

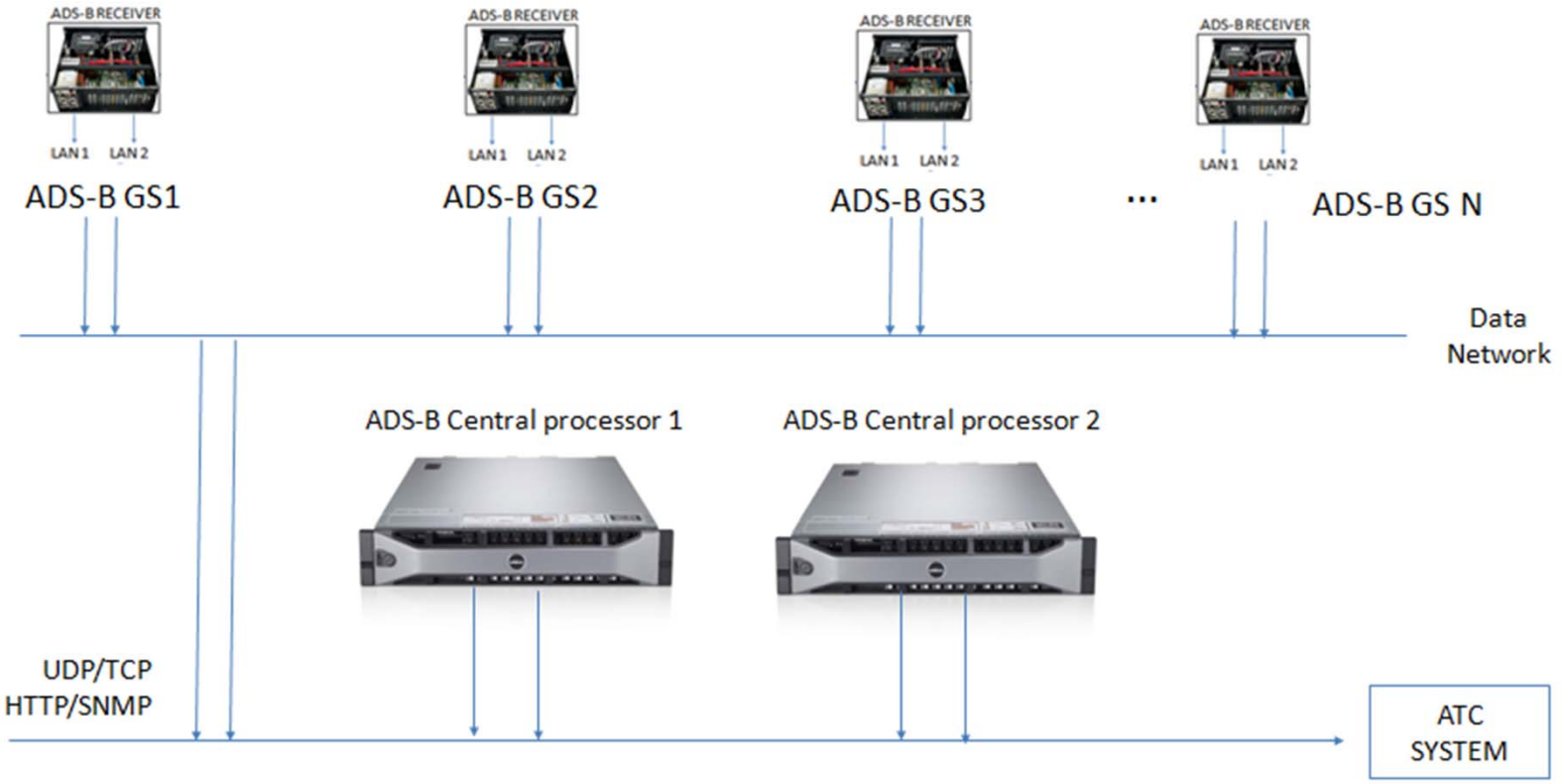
- Higher sensitivity. 3 dB more than previous version. Better than -90dBm. (Range increased)
- ADS-B data validation methods
- Dual power supply
- Dual storage (RAID 2 Hard Drives Hot Swap)
- Automatic re-start after power outage
- Increase processing capability (600 targets)
- New graphical CMS integrated

Features:

- Three (3) 1090 receivers inside
- Dual network interface
- Difference sizes & configurations
  - Rack mountable 19” or compact
  - Indoor/Outdoor

ADS-B CENTRAL PROCESSOR

- Used on ADS-B Networks with several receivers
- Only one interface with ATC System.
- **Fuses ADS-B data from up to 64 Ground Stations**.



ADS-B CENTRAL PROCESSOR

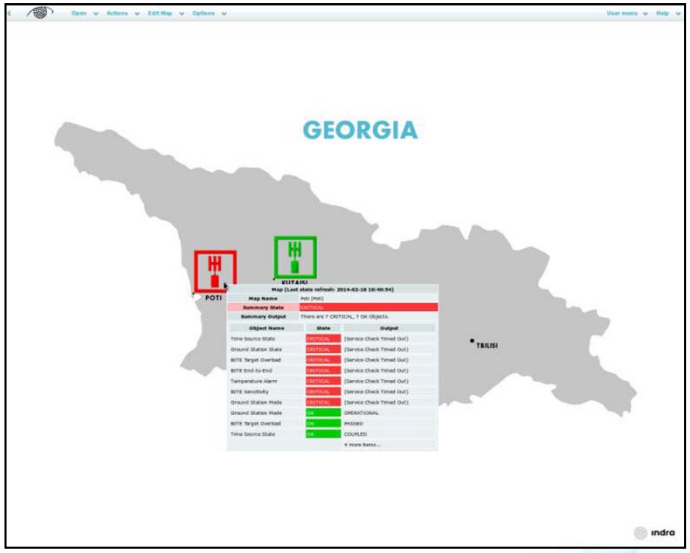
- **ADS-B Data Validation using TOA of several GSS**
- Accept different versions of Asterix 21 as an input and output the required Asterix 21 version to ATC System
- Processing Capacity for more than 2000 targets
- **Data filtering:**
  - By ICAO address
  - Using Asterix 023 and 247 information
  - By Quality indicators and FOM
  - By Altitude
  - By Area/Sector.
- LCMS integrated

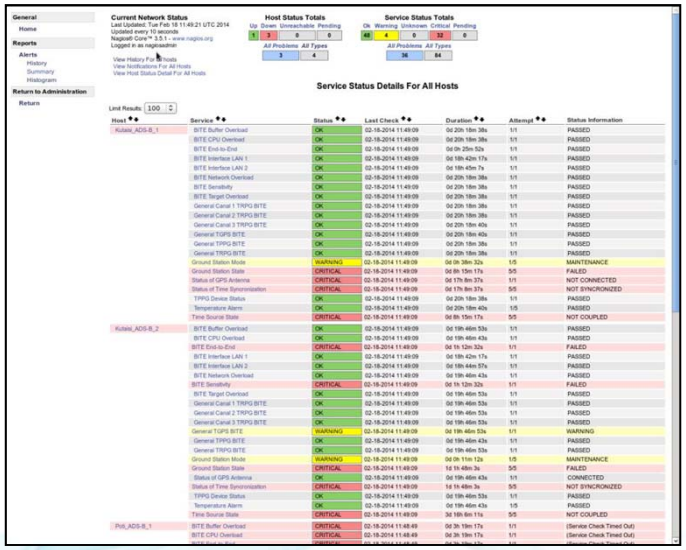
CONTROL AND MONITORING SYSTEM

- Supervision of the status of each LRU
- Supervision of operating parameters
- Reports and alarms management
- Secure Access
- Control of operational parameters
- **Statistic analysis and historic values**
- SNMP and WEB

CONTROL AND MONITORING SYSTEM

- Supervision of each Ground Station
- Location of Ground Stations in map
- Monitoring and control of parameters





CONTROL AND MONITORING SYSTEM

- Supervision of the status of each LRU
- **Friendly interface with visual location of each LRU**

CONTROL AND MONITORING SYSTEM

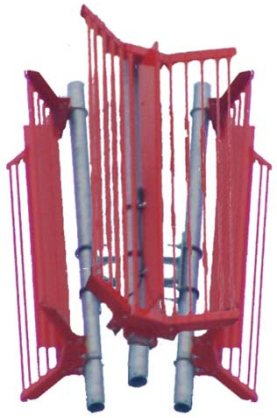
- **Statistical analyses and historical average values:**

ANTENNAS

- The Antenna Subsystem is composed of:
  - Three Sectorized antennas or
  - One Omni-directional antenna
  - RF Filters
  - Mast head box with LNA (Optional)

- Antenna columns are directional. Each column covers a minimum of 120º. This increases the range and reduces the noise received at each channel.

- Antenna Gain Options:
  - 12 dB for Long Range
  - 9 dB for Medium- Long Range
  - 5 dB Medium Range
  - 2 dB Airport Surveillance



- Options & Upgrades: Solar Panel , Diesel Generator and batteries for Outdoor.

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EXPERIENCE

- More than 8 years of ADS-B experience.

Country	Units	Customer
Morocco	6 (3x2) ADS-B	ONDA
Peru	2 (1x2) ADS-B	CORPAC
Barranquilla (Colombia)	20 (10x2) ADS-B	ACC
Libia (Tripoli and Benghazi)	4 (2x2)	LCAA
Mongolia	5 (5x1) ADS-B	MCAA
Georgia	4 (2x2) ADS-B	SAKAERONAVIGATSIA
France	1 (1X1) ADS-B	EUROCONTROL
Switzerland	2 (1x2) ADS-B	RUAG
Tegucigalpa (Honduras)	1 ADS-B	COCESNA
Turkey	2 (1X2) ADS-B	DHMI
Pakistan	1 ADS-B	PCAA
Colombia (Río Negro)	1 ADS-B	ACC
Barcelona (Spain)	32 (ADS-B +MLAT)	AENA
Vilnius (Lithuania)	11 (ADS-B +MLAT)	ORO NAVIGACIJA
Bogota (Colombia)	26 (ADS-B +MLAT)	ACC

Thank you

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